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Diagnostic exploitation of visual aftereffect measures in a moderately depressive patient group

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Abstract. - A group of 39 moderately depressive patients were tested before and after therapy with two serial aftereffect tests. One of them concerned size, intensity, and color of projected afterimages (AI), the other the duration of spiral aftereffects (SAE). AI and SAE data correlated highly with psychiatric ratings of depressive retardation, anxiety, and compulsion. These correlations formed the nucleus of three independent dimensions in a factorial space.

The present series of experiments was designed for two purposes: (1) to describe the effects of a new antidepressive chemical compound, and (2) to cross validate and further develop the diagnostic scoring dimensions of two visual aftereffect methods. The first aim cannot be pursued further until the present out-patient group has been extended to include more severe cases, but results pertaining to the diagnostic power of and interrelations between the two methods still deserve separate attention. The intention to study the effects of antidepressive therapy limited the range of clinical symptoms chosen for observation. However, the variation within this group of symptoms is still sufficient for correlational study.

One of the methods concerns size, intensity and color of visual afterimages projected at a distance 1.5 times the fixation distance; the other method scores the duration of spiral aftereffects on the perception of a stationary circle. In both experiments trials are repeated until the aftereffects have become reasonably stabilized and the statistical treatment is particularly devoted to the serial characteristics of data. The afterimage experiment (AI) as well as the spiral aftereffect experiment (SAE) have been used previously for diagnostic purposes (Smith & Kragh, 1967; Smith, Kragh, Eberhard, & Johnson, 1969; Andersson, 1967, 1969). A number of comparisons could, therefore, be planned in advance. However, specified hypotheses will not be advanced here but formulated in the relevant context of data presentation.

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Method and design

Both experiments have been described in detail elsewhere and the reader is referred chiefly to the most recent publications (Smith, Fries, & Andersson, 1969; Andersson, Fries, & Smith, 1969).

The AI experiment comprises a series of 20 measurements of the size, intensity, and color of visual afterimages. The stimulus is a 5 cm wide, red oval with eyes and a sad mouth drawn in black ink; the fixation distance is 39 cm, the projection distance, 59 cm, and the fixation time, 20 secs.

The strictly proportional, Emmert size of the image should be 8.3 cm. Actual size was measured by two movable, vertical rulers. Intensity was judged afterwards according to a ten degree scale; its polar reference points appeared as a dark and a light field on the screen. After each trial the afterimage was extinguished by means of a faint red hue projected over the surface.

The SAE experiment employs a rotating spiral (2 1/2 turns arithmetic; 120 rpm) as inducing stimulus and measures the duration of its effects on the perception of a subsequently exposed circle with black contours. The fixation time is 45 secs. There were altogether 20 massed trials in the main experiment. When the subject reported that the circle had stopped expanding or approaching, the spiral was immediately exposed again.

The subject started with three preliminary SAE trials, continued in the AI situation (which had no preliminary trials) and finished the experimental session with the main SAE experiment. When the program was repeated a second time the serial color word test (CWT) was added after the other measurements.

The psychiatric listing of symptoms done by J.R. above all concerned three dimensions: depressive retardation, anxiety and compulsion. Depressive retardation refers to a number of behavioral characteristics described in more detail in a previous publication (heavy, immobile, lingering expression around the eyes; slow movements devoid of purposeful drive; voice with

few nuances, etc; see Eberhard, Johnson, Nilsson, & Smith, 1965). On the whole, the scoring of retardation should be considered more liberal than in earlier diagnostic studies (Smith, Kragh, Eberhard, & Johnson, 1969). Anxiety covers anxiety attacks. Compulsion stands for such symptoms as rituals, obsessive thoughts and fears, extreme orderliness and other obsessive-compulsive habits.

The entire collection of data, then, consists of AI and SAE measures together with psychiatric symptom markings collected before any therapeutic treatment (including imipramine or the new compound), and again three weeks later when the treatment had not yet been terminated. The second data collection also included results from the CWT. A third, aftertreatment collection was of little value as far as the experiments were concerned and will not be used here. Most serials appear so contracted that little variation of clinical significance is left.

The subjects, 39 in all (16 men and 23 women) with an age range of 17-64 years and a median age of 34, were all out-patients at the University Hospital Psychiatric Clinic I in Lund. Originally, 61 patients, preliminary judged as depressive, had been selected to participate. Many of them were too ill to continue as out-patients and were eventually excluded. A few refused to take part in the project, did not take the prescribed medicine, or just disappeared from the waiting room. Some subjects with incomplete records have also been dropped.

Some general measures

In AI the two quantitative dimensions, size and intensity, are designated by the letters S and I. m_I stands for the mean value of 20 intensity judgements, m_S for the mean size of 20 measurements. For the description of serial characteristics S indices have been confined to 16 trials and I indices to 14. The reason for these deliminations is that size seems to be reasonably stabilized at the 16th trial and intensity some two trials earlier (Smith, Fries, & Andersson, 1969). R_S is, consequently, the linear size regression from phase 1 to 16 and R_I the intensity regression for 1-14. When the regression part of the variance has been isolated the residual variability, V, can be calculated for both S and I.

Analogous SAE indices are based on phases 1-10 for reasons similar to the above. R, the linear regression, will usually be dichotomized into positive and negative values (R+, R-). Another important parameter, FL or final level, stands for the mean of durations 9 and 10. FL data from the first experiment have been divided into four zones. The lowest zone, LL, comprises FL values below 1.5 secs. The next zone, L, is deliminated by the values 1.5 and 3.5. Between 4.0 and 12.0 there is a middle zone, M, and above 12.0 (up to 21.5) a high zone, H. The choice of cut-off points was guided by previous results. A H+ subject was characterized by a high FL and a positive regression, etc.

A great number of additional measures have also been used. In AI , for instance, color plays a central role in many comparisons. Other measures constructed to characterize curves with respect to anxiety, retardation, compulsion, etc., are more complicated. Many measures should be considered as alternatives to the ones exploited in the first part of this paper. Their usefulness will be tested in a factor analysis forming the second part of the paper. The presentation of additional measures can, therefore, be considerably limited and will be deferred to the appropriate context.

The CWT will serve mainly as a criterion instrument (see Smith & Nyman, 1964). Five series of times for reading color words printed in incongruent color, each series comprising five scores, result from a testing. A series is characterized by its linear regression (R) and residual variability (V) marked as high or low according to previous norms. Stabilized (S) protocols have on the whole even serials (R and V low). If most Vs are high a subject is dissociative (D), if Rs are high - cumulative (C). A combination of high Rs and Vs is termed cumulative-dissociative (CD). Given these primary R and V values, five of each per subject, secondary designations may be calculated in the same way. If V increases considerably but evenly the subject receives a high R_V, etc. On the basis of these values a subject may be classed as D_R (low R_R, high V_R), etc. An additional measure, I, concerns the amount of initial decrease of color word reading time as compared with subsequent decreases and implies a swift first adaptation followed by early stabilization.

Results of planned comparisons

Compulsive signs in AI

Previous experiments (Smith & Kragh, 1967; Andersson, Fries, & Smith, 1969) have indicated that a number of signs are typical of obsessive-compulsive patients. The present selection, partly guided by our intention to make the scoring as simple as possible, includes appearance of pure green (instead of the expected blueish) AI color as its most conspicuous sign. Since we also know that images tend to be relatively constricted in the beginning of compulsive serials and since we expect extreme intensity values to be rare, these two scoring dimensions have been added. When an afterimage serial is repeated it becomes more compressed. At the same time the number of small size values tends to increase while extreme intensity reports decrease. This factor has to be taken into account in the second serial to avoid the danger of inflating the compulsive scorings. The scoring rules are as follows:

First experiment:
(1) purely green color reports (not fewer than reports of red or reddish-violet hues); and/or,
(2) at least three small images (<8.5) in phases 1-10; and/or,
(3) not more than one extreme I marking (scale values 1-4 or 9-10).

Second experiment (additional):
(1) green color should be reported in phases 1-10.
(2) at least five small images in 1-10.
(3) no extreme I markings.

Because compulsive tendencies may be difficult to detect among patients often characterized by depressive retardation, we have added the I sign from CWT as an additional criterion of compulsiveness. However, CWT was administered only once. Criterion comparisons have, consequently, been limited to one experiment (Table I). When not otherwise indicated, probability values refer to Fisher's exact test of 2 x 2 tables.

The scoring has an obvious clinical validity to which all signs contribute. As expected, the compulsive tendencies remain stable from the first to

the second testing. Only 9 of 39 patients change designation ($P<.004$, one-tailed, $G=.54$).

Table I. AI signs of compulsion and the clinical criterion - first experiment.

Criterion: first diagnosis	AI: first experiment				
	1	2	3	Total	4
	green color	small images	medium intensity	1 - 3	The rest
Compulsive and/or I (CWT)	7	5	5	17	4
The rest	2	0	2	4	14

Comparison: 1,2,3/4 $P<.005$ (one-tailed) ($G=.60$)

Anxiety signs in AI

One of the first and most consistent findings (Smith & Kragh, 1957; Smith, Kragh, Eberhard, & Johnson, 1969; Andersson, Fries, & Smith, 1969) has been that anxiety is reflected in large and/or dark achromatic images. The present clinical scoring of anxiety refers to anxiety attacks and not just feelings of anxiety, and is obviously more conservative than criteria employed in the original studies. When exploiting established AI signs of anxiety we have, therefore, excluded the more marginal varieties. Dark achromatic images($I=9-10$) are accepted only if at the same time defensive color reactions appear in other sections of the serial and confirm the gravity of the sign. These color reactions include reports of green or reddish-violet hues, i.e., signs of compulsive defense mechanisms or of regressive tendencies. As far as image size is concerned, most anxiety cases have shown rising trends with large images (>11.0 cm) toward the end of their serials. However, in patients with both anxiety and depressive retardation the trend is often reversed (Smith, Kragh, Eberhard, & Johnson, 1969) with maxima placed early. Accepting this finding we still deem single, early large images as uncertain signs of anxiety if they are not accompanied by small images indicating subsequent defensive counter-measures. If a large image is reported as green or spotted with green we have seen it as a sign of a compulsive defense mechanism with at least moderate anxiety-averting effects. No change

in the scoring categories seemed to be necessary for the second experiment. They are the following:

First and second experiments:

(1) reports of dark (I = 9-10), achromatic images plus reports of defensive color reactions (at least two green, red or reddish-violet images); and/or,

(2) large images (> 11.0 cm), but not (a) green or green-spotted images, (b) single, early large images (phases 1-10) if two counterreactions (< 8.5 cm) are not scored.

The validation results in Table II are satisfactory. Moreover, the general anxiety marking remains stable from the first to the second experiment, only 7 of 38 patients (one missing) showing any change ($P < .004$, one-tailed, $G = .59$). Since the clinicians noted more improvement from the first to the second test than did the experimenters, the correlation between test signs and criteria is not significant the second time.

Table II. AI signs of anxiety and the clinical criterion - first experiment.

Criterion: first diagnosis	AI: first experiment			
	1 dark, achr, images	2 large images	Total 1 - 2	3 The rest
Anxiety	7	6	13	2
The rest	1	2	3	21

Comparison 1,2/3 $P < .002$ (one-tailed) ($G = 74$).

Anxiety signs in SAE

It has been shown that anxiety tendencies correspond to high time scores at least in the latter part of the SAE serials (Andersson, 1967, 1969). Since such a serial is generally stabilized after about ten trials we consider trials beyond the fifth as late. In order to keep the scoring of SAE about as conservative as the psychiatric marking of anxiety we have selected only values > 15 secs as indicative. A number of protocols have very low

time scores (≤ 1.5 secs) throughout. These patients appear to form a special category different from other patients with short SAE durations. They will be dealt with in particular comparisons later. Here they are excluded as indeterminate. The second SAE experiment has not been exploited here; duration values have decreased and do not permit construction of reliable parameters.

First experiment:
(1) at least one duration value in phases 6-20 > 15 secs.
(2) indeterminate if no value in phases 6-20 is > 1.5 secs.

Tables III and IV show that there is a substantial correlation with the clinical criteria and some correlation with the corresponding AI signs of anxiety.

Table III. AI and SAE signs of anxiety - first experiment.

AI: first experiment	SAE: first experiment		
	1	2	3
	Anxiety	Indeterminate	No anxiety
Anxiety	7	3	5
No anxiety	3	4	15

Comparison 1/3 P=.024 (one-tailed)

Table IV. SAE signs of anxiety and the clinical criterion - first experiment.

Criterion: first diagnosis	SAE: first experiment		
	1	2	3
Anxiety	8	3	4
No anxiety	2	4	16

Comparison 1/3 P=.003 (one-tailed)

Signs of retardation in AI and SAE

In retarded subjects AI size values were depressed at least toward the end of serials (Smith, Kragh, Eberhard, & Johnson, 1969). As shown in comparisons of sequential parameters between AI and SAE, however, AI

intensity values also carry important information often alternatively with size values (Smith, Fries, & Andersson, 1969). If size values are not depressed intensity values may diminish instead. When size and intensity scores are added phase for phase, the serial characteristics of the combined scores closely correspond to the curve of SAE durations. Analogous descriptive measures can, therefore, be used for both AI and SAE.

As indicated, the clinical marking of retardation was apparently more liberal than previously. Consequently, it cannot be expected that retardation will always dominate the latter part of the serial in its entirety. Returns to high values must be expected. With this in mind the present authors planned to use consecutive R values to describe retardation tendencies in the curves. These R values cover the regression over five phases each and overlap in the following way: R_1 is based on phases 1-5, R_2 on 4-8, R_3 on 7-11, etc. Six consecutive Rs are used for the AI dimensions, five for SAE which is shorter.

First experiment:
In AI R values ≤ 2.0 are considered unreliable in the size dimensions and values ≤ 4.0 in the intensity dimension. All possible sequences of consecutive R values are now tested until the sequence yielding the largest positive or negative sum has been found; the "unreliable" small R values are exploited in this operation only if necessary to tip the balance. In one subject, for instance, the following R values for size were obtained: -1.2, +3.7, -3.6, -1.6, -1.0, -2.8. The last four values were marked as the dominating sequence. Since I values have been shown to be somewhat less decisive than S values a special catch was introduced for the I dimension: the selected series should also include the largest absolute R value and its sign dominate the entire R sequence. In other cases the S dimension determines the final diagnosis; or if no dominant sequence can be found there, the sum of the entire I sequence if the last reliable (> 4.0) R value has the same sign as the dominant alternative. Retardation is scored when a dominant minus trend marked in at least one dimension is also the last trend.

In SAE R values ≤ 2.0 are considered unreliable. The dominant trend

is selected in the same way as for AI. If the sum of any trend does not exceed 2.0, as in most LL subjects, no indication can be made. Solitary Rs which deviate extremely appear in some patients. Such values are decisive if they amount to 1/3 of Σ R (irrespective of sign) +1. Retardation is thus scored when the minus trend is dominant or when an extreme negative R occurs.

It has often been observed that SAE sequences marked by dampening tendencies (R-) have a low variation around the main line of regression. The V (residual variability for phases 1-10) will, therefore, also be tried here.

Second experiment:

In AI a similar scoring has been based on the first three Rs. If all of them are "unreliable", or if the balance between plus and minus trends cannot be tipped, the trend marking may cross this limit and include later Rs.

In SAE no calculations were made for the second series of data because R values were very low throughout.

There is only a nonsignificant correlational tendency between AI and SAE scores based on R (18 of 28 coinciding). Surprisingly, the V measure in SAE yields better results (25 of 35 coinciding, P = .012, one-tailed). Both instruments correlate well with clinical criteria (Tables V - VII). If both of them are combined and double retardation signs ($R_{AI}+R_{SAE}$) are contrasted with no signs, 9 patients in the former group of 9 have the corresponding diagnosis and 0 in the latter group of 9 (P = .000). In the same way R retardation in AI and V retardation in SAE can be combined. The analogous contrast is now 13-2/2-8 (P = .001, one-tailed). Finally, it can be shown that signs of retardation in the second AI experiment are also indicative.

Color in AI

Even if the color groupings used here refer to previous experiments with the AI, most comparisons should rather be considered exploratory.

Table V. AI signs of retardation (consecutive Rs) and the clinical criterion - first experiment.

Criterion: first diagnosis	AI: first experiment	
	Retardation	No retardation
Retardation	17	7
No retardation	1	10

$P < .003$ (one-tailed)

Table VI. SAE signs of retardation (consecutive Rs) and the clinical criterion - first experiment.

Criterion: first diagnosis	SAE: first experiment	
	Retardation	No retardation
Retardation	13	4
No retardation	3	10

$P = .015 - .0015$ (one-tailed)

Table VII. AI signs of retardation (consecutive Rs) and the clinical criterion - second experiment.

Criterion: second diagnosis	AI: second experiment	
	Retardation	No retardation
Retardation	8	4
No retardation	4	22

$P < .01$ (one-tailed)

In Table VIII a group of the clinically most "restricted" patients is compared with a group of the least "restricted" ones. Retardation without anxiety stands for restriction, absence of retardation and compulsive symptoms for lack of restriction. With absence of reddish color and of large images selected as a sign of restriction in the experiment a significant correlation is obtained. Generally, protocols of "restricted" patients seem to be dominated by blueish or grey hues (Table IX).

Table VIII. AI signs of "restriction" and clinical criteria - first experiment.

Criterion: first diagnosis	AI: first experiment	
	No image > 15.0 No red	Some image > 15.0 or red
Retard., no anx.	13	3
No ret., no comp.	1	14

P < .006 (two-tailed)

Table IX. AI color and the clinical criteria of retardation and anxiety - first experiment.

Criteria: first diagnosis	AI: first experiment Dominating color	
	Blue/ blue-violet/ blue-grey/grey	Other colors
Retard., no anx.	12	4
Anx., no retard.	1	6

P = .023 (two-tailed)

As implied by the scoring of anxiety in AI, presence of red, reddish-violet, or green color is an indication of anxiety. If such a color sign (reddish + green versus no such report) is used alone in comparison with the clinical criterion we get 6 anxiety and 0 nonanxiety cases in the presence group versus 3-10 in the absence group (P= .003, one-tailed).

Some comparisons with the SAE groups may also be enlightening. It was soon observed that the LL group (with extremely short durations) differs from all other groups in the domination of its sequences by green, grey-green, or grey (not black-grey) colors (z, according to Mann-Whitney, = 4.73, P= .000). However, LL and L- have some characteristics in common. We know of the L- group that it is primitive (extraceptive) and have observed in another L- sample frequent reports of "primitive" color late in the AI sequence (Smith, Fries, & Andersson, 1969). Reddish (positive) colors are deemed "immature" or regressive but also grey color which may emerge as a compromise between competing positive and negative hues. Because of the slightly blueish illumination blue-grey is

added (Table X). Moreover, the L- and M- groups differ from the more extreme groups on both sides by having either more grey or blue-grey reports than black-grey or black ones or more reddish-violet reports than green ones ($P < .032$, two-tailed). In sum, LL and L- then share to some degree "primitive" color signs (reddish, grey) but LL has, in addition, more signs of control (green). Reports of dark hues tend to belong to the H and M+ groups.

Table X. AI color and SAE types - first experiment.

SAE type: first experiment	AI: first experiment	
	Report in phases 8-14: red/ violet/ (blue)- grey	Other colors only
LL and L-	9	6
Others	4	20

$\chi^2 = 10.4$ $P < .005$ (one-tailed)

Results of factor analysis

Altogether 95 variables were used for the factor analysis. They included measures taken from the first and second applications of SAE and AI, clinical ratings given at these occasions as well as ratings of change and CWT measures. Each sign was scored for presence or absence and the factor analysis was based on the intercorrelations of the dichotomous variables. The balance between presence and absence scores had to be at least 90 - 10% (or the reverse) for a sign to be accepted.

Our main interest was centered about the question of whether the correlations between clinical ratings of retardation, anxiety, and compulsion, on the one hand, and experimental measures, on the other, could also be represented as reasonably independent dimensions in a factorial space. In order to test such a possibility, 12 variables of the original 95, were selected for analysis, each alleged vector being represented by at least 3 measures. Thus the primary factor analysis of the study included three groups of measures believed to represent three independent factors. As a result of the factoring procedures, three isolates which will be presented subsequently emerged in a clear-cut manner, thus supporting in totality

the factor analysis hypothesis.

As a secondary step, in order to extend our factor solution to include more items, a correlational analysis was carried out. The total score based on all items representing each factor was used as an estimated factor score for each person for each of the three factors. Such estimates, then, were correlated against all other items of the study to yield estimates of correlation for all items with each of the three factors.

Only those items with reasonably high correlational values were used as constituent measures of each of the three factors. The entries of Tables XI, XII, and XIII (where measures used in the primary factor analysis have been marked with asterisks) include a selection of these values ($\geq .40$). It might be mentioned that the split half reliabilities computed on the basis of the scores of the test population for the constituent items were found to be .87, .89, and .73 for factors I, II, and III respectively.

Table XI. Factor I: Depressive retardation.

Variable	Factor and loading		
	I	II	III
1. Clinical retardation, first exp.	.86[x]	-.36	.12
2. AI retardation, first exp.	.74[x]	-.24	.04
3. Clinical ret., not anx., first exp.	.71[x]	-.65	.29
4. AI + SAE retardation, first exp.	.60	-.02	.14
5. SAE retardation, first exp.	.59[x]	-.04	.00
6. SAE, high residual V, first exp.	-.57	.41	.11
7. CWT, C-type	-.53	.23	-.03
8. Clinical retardation, sec. exp.	.51	-.27	.12
9. Clinical anx., not ret., first exp.	-.49	.69	.03
10. Clinical ret., not anx., sec. exp.	.44	-.40	.04

[x]Included in the hypothesis.

Table XII. Factor II: Anxiety.

Variable	Factor and loading		
	I	II	III
21. Clinical anxiety, first exp.	-.29	.93[x]	-.13
22. AI anxiety, first exp.	-.39	.80[x]	-.14
23. Clinical anx., not ret., first exp.	-.49	.69[x]	.03
24. SAE anxiety, first exp.	-.23	.69[x]	-.03
25. AI green images, sec. exp.	-.15	.56	.07
26. AI anxiety, sec. exp.	-.17	.55	-.16
27. Clinical improvement of anxiety.	-.20	.53	-.01
28. Clinical anxiety, sec. exp.	-.12	.51	-.10
29. AI images > 11.0, first exp.	-.22	.51	-.08
30. AI red-violet images, first exp.	-.24	.51	-.04
31. AI more green than red-violet, sec. exp.	-.21	.50	.16
32. Clinical anx., not ret., sec. exp.	-.27	.48	-.12
33. Clinical anx. + ret., first exp.	.12	.46	-.18
34. AI large m_S, first exp.	-.19	.45	.05
35. AI images > 11.0, sec. exp.	-.24	.41	-.05
36. AI red-violet images, sec. exp.	-.14	.41	-.24
37. AI red-violet + green images, first exp.	-.16	.40	.17

[x]Included in the hypothesis.

Table XIII. Factor III: Compulsion.

Variable	Factor and loading		
	I	II	III
40. AI compulsion, first exp.	.17	-.18	.81[x]
41. Clinical compulsion, first exp.	.00	-.15	.64[x]
42. CWT I-type.	.08	.22	.61[x]
43. Clinical compulsion, sec. exp.	-.07	.05	.48
44. AI negative R_I, first exp.	.27	.05	-.43
45. AI more green than red-violet, first exp.	-.18	.22	.41

[x]Included in the hypothesis

Factor I, depressive retardation, does not reveal much beyond what has been presented in the first section of this paper (Table XI). Variable 7 confirms previous results that subjects dominated by high R values in the CWT (C types), characterized clinically by anxiety and strong defenses against insight (Smith & Nyman, 1964), are not very likely to show conspicuous signs of depression. Variables 3, 9, 10, and 6 are also loaded in Factor II, anxiety. For 3, 9, and 10 this phenomenon was expected since anxiety was part of their definition. Variable 6 showed a higher correlation with the clinical criterion than 5. However the latter variable constructed according the same principles as 2 is obviously more pure.

Factor II comprises signs of anxiety (Table XII). It may be observed that among variables included in the composite AI anxiety measure (22), large size (29) and reddish color (30) have comparatively high loadings and green color (25, 31) becomes especially obvious after treatment when, apparently, control mechanisms take over more and more.

Factor III is more limited than the first two, partly because no particular SAE measures of compulsion were constructed. Among the single measures constituting the composite variable 40, green color (45) seems to be the most powerful. Variable 44 indicates that small intensity values are more common at the beginning of compulsive AI serials than at the end.

In an effort to obtain new factors, in addition to the first three isolates of this study, a second factor analysis was conducted. The variables of the score matrix were some 46 items whose correlations with the first three factors were sufficiently low so that the independence of any emerging parameter could be assured. It might be mentioned that the rationale for conducting a factor analysis in such a manner has been properly documented (Holley & Elmgren, 1969). As a consequence three additional factors were obtained, bringing the total in the study to six.

Factor IV with a reliability of .89 was exclusively an intensity dimension and comprised such AI variables as dark achromatic images, extreme intensity ratings and reports of features in the AI. A very mixed Factor V had a poor reliability (.56). The last Factor VI had a somewhat higher reliability figure (.77). It combined the clinical rating of little or no general

improvement with such pathologic signs in the second experiment as increase of the number of large AIs, positive regression of AI_S and high secondary variability in the CWT. Good prognostic signs would, according to this factor, be the LL type in SAE and greyish or green color in AI.

Conclusions

The present study was planned chiefly as a cross validation of three groups of diagnostic signs in the AI and SAE experiments. Results Showed good agreement with predictions. Since the subjects were generally less disturbed than those used in the original clinical studies, scoring standards had to be adjusted accordingly and cannot be regarded as fixed. A number of new findings have also been presented. In spite of this some generalizations seem reasonable.

Obsessive- compulsive tendencies were most clearly revealed by green color reports in the AI situation. Additional compulsive characteristics were appearances of relatively constricted images, particularly in the early sections of a serial, and also absence of extreme intensity ratings. SAE parameters did not associate with the compulsive dimension in this sample.

Large and/or dark achromatic AIs were again conspicuous signs of anxiety. Reports of reddish hues had a particularly powerful additional impact and to some extent reports of green hues, i.e.,reports interpreted to signify a mobilization of defensive mechanisms. In SAE long durations in the later sections of the serial gave a highly significant criterion correlation and fitted well within the anxiety factor.

Retardation was revealed by analogous signs in the AI and SAE, i.e., by the dominance of negative serial trends. A higher criterion correlation was obtained in SAE by using the residual variance of a serial, but this measure seemed to be less pure factorially.

The meaning of these signs has already been discussed in previous publications and to some extent above. Here it may suffice to say that while signs of anxiety reveal a growing dominance of subjective factors in the

adaptation of an aftereffect to outside reality, signs of retardation imply a subsequent restriction of the play allowed such factors. The hallmark of compulsive tendencies seems to be a sort of pseudo adherence to stimulus. A brilliantly green hue is not strictly complementory to the red stimulus but rather a most obvious negation of the dull shades of anxiety. And a small size image may not be more adherent to the Emmert law than a larger one but certainly more different from anxiety type images.

A note of caution has already been introduced. Even if criterion correlations were generally very high for a clinical study they concern a special group of subjects. An effective differentiation within this group of moderately depressive patients does not mean that its diagnostic subgroups necessarily differ from outside groups. Even if we know a great deal more about the measures presented here, as for example, that anxiety signs differentiate irrespective of the presence or absence of depressive symptoms, more systematic diagnostic research has to be carried out.

Also worthy of note is the fact that classification norms depend not only on the sample and the clinical ratings used to describe it but also on the situational parameters. Since we would like to remain free to find optimal experimental procedures for all kinds of problems in the aftereffect field, parameters for practical clinical use have not yet been fixed. We know, however, that changes in measuring contrivance, stimulus hue and duration, instructions, etc., can have very far-reaching consequences.

Thus the present study was not intended to furnish diagnostic norms but to show that AI and SAE can be successfully exploited for describing important pathologic dimensions.

References

Andersson, A.L. (1967). Adaptive visual aftereffect processes as related to patterns of colour-word interference serials. Perc. mot. Skills, 25, 437-453.

Andersson, A.L. (1969). Adaptive regulation of visual aftereffect duration and social-emotional adjustment. Acta Psychol., 29, 1-34.

Andersson,A.L., Fries,I., & Smith,G.J.W. (1969). Change in afterimage and spiral aftereffect serials due to anxiety caused by subliminal threat. Scand. J. Psychol., 10 (in press).

Eberhard,G., Johnson,G., Nilsson,L., & Smith, G.J.W. (1965). Clinical and experimental approaches to the description of depression and anti-depressive therapy. Acta Psychiat. Scand., Monogr. Suppl., 41, No. 186.

Holley,J.W. & Elmgren,J. (1969). On the construction of orthogonal measures. Scand. J. Psychol., 10 (in press).

Smith,G.J.W.,Fries,I., & Andersson, A.L. (1969). Negative afterimages and spiral aftereffects: comparisons between two kinds of perceptual processes. Perc. mot. Skills, 28, 767-775.

Smith,G.J.W. & Kragh,U. (1967). A serial afterimage experiment in clinical diagnostics. Scand. J. Psychol., 8, 52-64.

Smith,G.J.W., Kragh,U., Eberhard,G., & Johnson,G. (1969). Forms of depression as reflected in negative afterimage serials. Acta Psychiat. Scand., 45 (in press).

Smith,G.J.W. & Nyman,G.E. (1964). The serial colour-word test, a summary of results. Stockholm: Skand. Testförlaget.

PSYCHOLOGICAL RESEARCH BULLETIN

1961 I, 1—5

1962 II, 1—10

1963 III, 1—7

1964

IV, 1 *Tachistoscopic technique and perception of facial photographs,* Ingvar Bokander.
IV, 2 *Semantic description of complex and meaningful stimulus material,* Ingvar Bokander.
IV, 3 *Preconscious perception of facial photographs,* Ingvar Bokander.
IV, 4 *Psychophysical experiments on colour saturation,* Lennart Holmberg.
IV, 5 *Differentiation of character neurosis and symptom neurosis on the basis of differences between two serial experiments,* Gudmund J. W. Smith, Lennart Nilsson, & Gunnar Johnson.
IV, 6 *The problem of retesting in the serial colour-word test,* Gudmund J. W. Smith & Gunnar A. V. Borg.
IV, 7 *Experimental description of a group of psychiatric patients before and after therapy by means of MCT (the meta-contrast technique) and CWT (the serial colour-word test),* Gudmund J. W. Smith & Gunnar Johnson.
IV, 8 *A serial rod-and-frame test,* Göran Eberhard.
IV, 9 *A stereoscope designed for use in research on motivated perception,* Ingvar Bokander.
IV, 10 *Binocular rivalry as affected by simultaneous auditory stimulation,* Gunnar Johnson & Holger Klintman.
IV, 11 *Studies in gestalt perception by means of motion-picture stimulus presentation,* Gunnar Johnson & Clemens Weikert.
IV, 12 *An analysis of aggression and identification in young offenders by the study of perceptual development,* Ulf Kragh & Tore Kroon.

1965

V, 1 *Consideration and initiating structure: two dimensions of supervision?,* Lennart Lennerlöf.
V, 2 *The relation between MNT-dimensions and certain cognitive and psychomotor variables,* Sven Marke & Eric Olsson.
V, 3 *Discontinuity in the subjective scale of color saturation as a result of a shift of instruction,* Lennart Holmberg.
V, 4 *The formal authority of the supervisor,* Lennart Lennerlöf.
V, 5 *Optical analysis of EEG changes during electro-convulsive and imipramine treatment. A differential study,* Lennart Nilsson & Gudmund J. W. Smith.
V, 6 *The effect of electroshock and imipramine treatment on figural fluctuations in a group of psychiatric patients,* Zvonimir Cesarec & Lennart Nilsson.
V, 7 *Attitudes to supervisory motivation,* Lennart Lennerlöf.
V, 8 *The importance of arousal potential and light intensity in stereoscopically induced perceptual conflict,* Ingvar Bokander.
V, 9 *Serial change in the size of projected negative afterimages as indicative of personality aberrations,* Gudmund J. W. Smith & Ulf Kragh.
V, 10 *Perceptual defence mechanisms registered by the meta-contrast technique in normal and pathologic children,* Kerstin Lindbom.
V, 11 *The equivalence between two versions of the meta-contrast technique applied to a population of normal children,* Kerstin Lindbom.
V, 12 *Perception-personality and the operational present: A developmental paradigm,* Ulf Kragh & Gudmund J. W. Smith.

(cont. on inside cover)

1966

VI, 1 *The perception of volume content of rectangular rooms as a function of the ratio between depth and width,* Lennart Holmberg, Rikard Küller, & Inger Tidblom.

VI, 2 *The rod-and-frame test and emotional maturity,* Göran Eberhard & Lennart Nilsson.

VI, 3 *The solution of perceptual conflict between stereoscopically presented facial photographs,* Ingvar Bokander & Karl Radeborg.

VI, 4 *Stability and equivalence of adaptive figural and spiral after-effect processes,* Alf L. Andersson.

VI, 5 *Adaptive visual after-effect processes as related to patterns of colour-word interference serials,* Alf L. Andersson.

VI, 6 *Variations in percept-intensity: an attempt at relating adaptive visual after-effect processes to personality,* Alf L. Andersson.

VI, 7 *Stability of individual and group data in the perception of volume content of rectangular rooms as measured by a production and an estimation method,* Lennart Holmberg, Rikard Küller, & Inger Tidblom.

VI, 8 *Changes in perceptual defense after exposure to threat: A contribution to the validation of the meta-contrast technique (MCT),* Kerstin Lindbom.

1967

VII, 1 *Level and change of performance in a modified Wisconsin Card Sorting Test as related to colour-word test adaption,* Per-Erik Almgren.

VII, 2 *Pupillographic recording in stereoscopically induced perceptual conflict,* Ingvar Bokander.

VII, 3 *On percept-intensity regulation and depressive states,* Alf L. Andersson.

VII, 4 *Measurement of masculinity-feminity,* Sven Marke & Ingrid Gottfries.

VII, 5 *The oculogyral illusion—a form of rotation after-effect—and its relation to the spiral after-effect in repeated trials,* Alf Nilsson & N. G. Henriksson.

VII, 6 *Adaptive patterns in the oculogyral illusion and their relations to the serial color-word test,* Alf Nilsson & N. G. Henriksson.

VII, 7 *Differentiation of psychotic subjects by means of the meta-contrast technique. A preliminary study,* Gudmund J. W. Smith.

VII, 8 *A comparison between two methods for assessing need-related job factors,* Göran Ekvall.

VII, 9 *The perception of volume content of rectangular rooms. Comparison between model and full scale experiments,* Lennart Holmberg, Sonja Almgren, Anne Cathrine Söderpalm, & Rikard Küller.

VII, 10 *Negative afterimages and spiral after-effects: comparisons between two kinds of perceptual processes,* Gudmund J. W. Smith, Ingrid Fries, & Alf L. Andersson.

VII, 11 *The psychophysics of the size-weight illusion. I. Functional relation between heaviness and volume estimations,* Ingrid Fries & Lennart Holmberg.

VII, 12 *Dream reports and percept-genetic defensive organization in the DMT,* Martin Johnson.

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1968

VIII, 1 *The psychophysics of the size-weight illusion. II. Extension of the stimulus range,* Lennart Holmberg, Karin Hellsten, & Bodil Hector.

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VIII, 10 *Orthographic and frequency factors in verbal reaction time,* Holger Klintman.